Homework #1
Due Th. 9/04

1. (OS 2.4)

   Confirm your answer using Matlab. Provide a plot of the output.

2. (OS 2.33)

   Use Matlab for plots in (c) but you should understand how to sketch them.

3. (OS 2.47)

4. (OS 2.77)

   Use Matlab for plots in (c).

5. For each of the following systems, determine whether the system is (1) stable, (2) causal, (3) linear, and (4) time-invariant.

   (a) $T(x[n]) = (\cos \pi n)x[n]$

   (b) $T(x[n]) = x[n^2]$

   (c) $T(x[n]) = x[n] \sum_{k=0}^{\infty} \delta[n - k]$

   (d) $T(x[n]) = \sum_{k=n-1}^{\infty} x[k]$

   (e) $T(x[n]) = ax[n] + b$

6. For any $0 < N_1, N_2 < \infty$,

   (a) For $a \neq 1$, find a closed form expression for

   $$\sum_{n=N_1}^{N_2} a^n$$

   (b) For $|a| < 1$, find a closed form expression for

   $$\sum_{n=N_1}^{\infty} a^n.$$

7. Given the two sequences

   $$x[n] = u[n] \hspace{3cm} h[n] = a^{-n}u[-n]$$

   (a) By direct evaluation of the convolution sum formula, find $y[n] = h[n] * x[n]$.

   (b) Calculate the correlation beteween $x[n]$ and $h[n]$ where the correlation is defined as

   $$c_{xh}[l] = \sum_{k=-\infty}^{\infty} x[k]h[l + k].$$